

WHAT IS CLAIMED IS:

- 1 1. An optical device comprising:
2 an optical cavity;
3 an optical gain medium that generates light in said optical cavity;
4 and
5 an aberration-corrected focusing diffractive optical element
6 optically coupled to said optical gain medium to receive said light from said
7 optical gain medium, said aberration-corrected focusing diffractive optical
8 element being configured to diffractively focus said light of a selected wavelength
9 back onto said optical gain medium to cause said light of said selected wavelength
10 to resonate within said optical cavity.
- 1 2. The optical device of claim 1 wherein said aberration-corrected focusing
2 diffractive optical element is configured to correct effects of spherical aberration.
- 1 3. The optical device of claim 2 wherein said aberration-corrected focusing
2 diffractive optical element includes circular gratings separated by radius-
3 dependent periodicities, said periodicities being based on an aspheric diffractive
4 surface to compensate for deviations in angles of diffraction due to said spherical
5 aberration.
- 1 4. The optical device of claim 3 wherein said circular gratings of said
2 aberration-corrected focusing diffractive optical element have a profile selected
3 from a sinusoidal profile, a rectangular profile, a triangular profile and a sawtooth
4 profile.
- 1 5. The optical device of claim 1 further comprising a reflective element
2 optically coupled to said aberration-corrected focusing diffractive optical element
3 to reflect at least some of said light from said aberration-corrected focusing
4 diffractive optical element to said optical gain medium.

1 6. The optical device of claim 5 wherein said aberration-corrected focusing
2 diffractive optical element is transmissive.

1 7. The optical device of claim 6 wherein said aberration-corrected focusing
2 diffractive optical element is positioned between said optical gain medium and
3 said reflective element.

1 8. The optical device of claim 5 wherein said aberration-corrected focusing
2 diffractive optical element is reflective.

1 9. The optical device of claim 8 wherein said optical gain medium is
2 positioned between said reflective element and said aberration-corrected focusing
3 diffractive optical element.

1 10. A method for selectively emitting light, said method comprising:
2 generating light;
3 reflecting said light within an optical cavity;
4 wavelength selectively diffracting said light within said optical
5 cavity so that said light of a selected wavelength is resonant within said optical
6 cavity, including correcting effects of an aberration related to said diffracting; and
7 emitting said light of said selected wavelength from said optical
8 cavity as output light.

1 11. The method of claim 10 wherein said correcting includes correcting effects
2 of spherical aberration related to said diffracting.

1 12. The method of claim 11 wherein said correcting includes compensating for
2 deviations in angles of diffraction due to said spherical aberration using circular
3 gratings separated by radius-dependent periodicities, said periodicities being
4 based on an aspheric diffractive surface.

1 13. The method of claim 10 wherein said wavelength selectively diffracting
2 includes transmitting said light within said optical cavity.

- 1 14. The method of claim 10 wherein said wavelength selectively diffracting
2 includes reflecting said light within said optical cavity.
- 1 15. An optical device comprising:
2 a light source operable to generate light;
3 an aberration-corrected diffractive optical element configured to
4 diffractively focus said light of a selected wavelength back onto said light source;
5 and
6 means for reflecting at least some of said light from said focusing
7 means to said light source, said reflecting means partially defining an optical
8 cavity resonant at said light of said selected wavelength.
- 1 16. The optical device of claim 15 wherein said aberration-corrected
2 diffractive optical element is configured to correct effects of spherical aberration.
- 1 17. The optical device of claim 16 wherein said aberration-corrected
2 diffractive optical element includes circular gratings separated by radius-
3 dependent periodicities, said periodicities being based on an aspheric diffractive
4 surface to compensate for deviations in angles of diffraction due to said spherical
5 aberration.
- 1 18. The optical device of claim 17 wherein said circular gratings of said
2 aberration-corrected diffractive optical element have a profile selected from a
3 sinusoidal profile, a rectangular profile, a triangular profile and a sawtooth profile.
- 1 19. The optical device of claim 17 wherein said aberration-corrected
2 diffractive optical element is positioned between said light source and said
3 reflecting means, said aberration-corrected diffractive optical element being
4 transmissive.

- 1 20. The optical device of claim 15 wherein said light source is positioned
- 2 between said aberration-corrected diffractive optical element and said reflecting
- 3 means, said aberration-corrected diffractive optical element being reflective.